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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/709,439	05/05/2004	Achyut Kumar Dutta		3438

7590 12/20/2005

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EXAMINER
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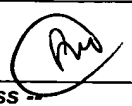
LOUIE, WAI SING

ART UNIT	PAPER NUMBER
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2814

DATE MAILED: 12/20/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	Application No. 10/709,439	Applicant(s) DUTTA, ACHYUT KUMAR	
	Examiner Wai-Sing Louie	Art Unit 2814	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 12 October 2005.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) 3,4,6-13,15,16,18 and 19 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,2,5,14,17 and 20 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |   |   |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)             | 4) <input type="checkbox"/> Interview Summary (PTO-413)                     |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)    | Paper No(s)/Mail Date. _____  |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____   | 6) <input type="checkbox"/> Other: _____                                    |

### DETAILED ACTION

Applicant's election without traverse of Group I, claims 1-2, 5, 14, 17, and 20, in the reply filed on 10/12/05, is acknowledged. It is suggested that all the non-elected claims be canceled in the response to this Office Action.

### *Claim Rejections - 35 USC § 102*

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claim 1 is rejected under 35 U.S.C. 102(b) as being anticipated by Tsuji (US 6,350,998).

With regard to claim 1, Tsuji discloses an avalanche multiplication type semiconductor photodetector (col. 3, line 56 to col. 9, line 20 and fig. 17) comprising:

- A first ohmic contact layer 10 (col. 8, line 9 and fig. 6);
- a semiconductor structure including layers 1 to 7 (col. 7, lines 50-62 and fig. 6):
  - a substrate 1 (col. 7, line 52);
  - a highly doped buffer layer 2, material-type same as the substrate 1 (col. 7, line 53);
  - a multiplication layers 3 of InGaAs with different contents (graded) for absorption layer (col. 7, lines 54-56);

- a doped thin layer 4 of InGaAs (col. 7, line 57);
- a highly doped thick layer 7 of InGaAs for the second ohmic contact 9 (col. 7, lines 61-62);
- second ohmic metal contact 9 on the top of the thick doped layer 7 (col. 8, line 8).

### *Claim Rejections - 35 USC § 103*

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 2 and 5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tsuji (US 6,350,998) in view of Yamaguchi et al. (US 6,949,770).

With regard to claim 2, Tsuji discloses a photodetector, but does not disclose an array of photodetectors. However, Yamaguchi et al. disclose an array of photodiodes (Yamaguchi col. 3, lines 57-59 and fig. 3). Yamaguchi et al. teach an array of photodiodes can reduce the size and pitch of the photodiodes and reduce the crosstalk between the diodes (Yamaguchi col. 1, lines 9-11). Therefore, it would have been obvious to one of ordinary skill in the art to modify Tsuji's device with the teaching of Yamaguchi et al. to form an array of photodiodes in order to reduce the size and pitch of the photodiodes and reduce the crosstalk between the diodes.

Tsuji modified by Yamaguchi et al. disclose a NxN photodiode array comprises:

- A common ohmic metal contact layer 23 on the backside of the substrate 10 for all photodiodes in the array (Yamaguchi col. 4, lines 52-53);
- The semiconductor structure (see claim 1 above);
- The second ohmic contact layer 9 on the top of the highly doped thick InGaAs 7 (see claim 1 above);
- Interconnection metal line, where each metal line is connecting each photodiode to the outside pad 50 to make independently addressable (Yamaguchi fig. 7a).

With regard to claim 5, in addition to the limitations disclosed in claims 1-2 above, Tsuji modified by Yamaguchi et al. also disclose:

- An etch-off substrate 17 to open for light illumination (Yamaguchi fig. 5a);
- Tsuji modified by Yamaguchi et al. do not disclose the second ohmic contact can be flip-chip bonded. However, both photodiode chips, disclosed by Tsuji and Yamaguchi et al., could be flip-chip bonded, which is commonly done in the art.

Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tsuji (US 6,350,998) modified by Yamaguchi et al. (US 6,949,770) as applied to claim 2 above, and further in view of Eby et al. (US 5,302,449).

With regard to claim 14, Tsuji modified by Yamaguchi et al. disclose an antireflective (ARC) coating 22 made of  $\text{SiO}_x\text{N}_y$  (Yamaguchi col. 4, lines 42-43), but do not disclose the ARC is metal oxide. However, Eby et al. disclose an ARC layer 70 on the photodiode (Eby col. 7, lines 1-20). Eby et al. teach the ARC serves two important functions, which is reducing the reflection and protecting the reflective metal layer from the environment (Eby col. 1, lines 36-

49). Hence, it would have been obvious at the time the invention was made to modify Tsuji's device with the teaching of Yamaguchi et al. and Eby et al. to provide an metal oxide ARC on the photodiode in order to reduce light reflection and to protect the reflective layer.

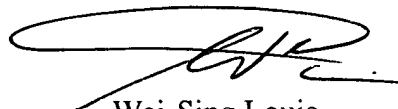
Claims 17 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tsuji (US 6,350,998) modified by Yamaguchi et al. (US 6,949,770) as applied to claim 2 above, and further in view of Fasen et al. (US 6,765,276).

With regard to claims 17 and 20, Tsuji modified by Yamaguchi et al. do not disclose a fixed or tunable filter on the photodiode. However, Fasen et al. disclose a set of color filter 14 (Fasen col. 3, line 36 and fig. 1). Fasen et al. teach the color filter allows only a relatively narrow radiation wavelength range to reach the photodiode (Fasen col. 1, lines 41-48). Thus, it would have been obvious to one of ordinary skill in the art to modify Tsuji's device with the teaching of Yamaguchi et al. and Fasen et al. to provide a color filter on top of the photodiode in order to narrow the range of radiation wavelength to enter the photodiode.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Wai-Sing Louie whose telephone number is (571) 272-1709. The examiner can normally be reached on 7:30 AM to 4:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy can be reached on (571) 272-1705. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

A handwritten signature in black ink, appearing to read 'Wai-Sing Louie', with a stylized flourish at the end.

Wai-Sing Louie  
Patent Examiner

Wsl  
December 15, 2005.